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SELF-EFFICACY TO OVERCOME EXERCISE BARRIERS IN INDIVIDUALS WITH CANCER-RELATED LYMPHEDEMA

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ABSTRACT

Although cancer survivors are recommended to exercise, they may lack confidence (self-efficacy) to be active. This research aimed to measure exercise barriers and related self-efficacy in individuals with cancer-related lymphedema as well as examine relationships between self-efficacy and participant characteristics. A cross-sectional survey was undertaken in individuals with cancer-related lymphedema using a validated 14-item Likert scale assessing self-efficacy to overcome general and lymphedema-specific exercise barriers (0%=not at all confident, 100%=extremely confident). Demographic, medical and lymphedema data were also collected. Of 109 participants (52% response), 79% (n=86) had breast cancer-related lymphedema. Participants were found to be moderately confident to exercise when facing general (48% [95% CI: 44, 52]) and lymphedema-specific exercise barriers (51% [95% CI: 47, 55]). Participants who were female, sedentary ($p<0.05$), had lymphedema for ≥2 years, and reported greater symptom burden ($p<0.05$) recorded lower general exercise barriers self-efficacy. Lower lymphedema-specific exercise barriers self-efficacy was reported by individuals who were sedentary, had cancers other than breast, and higher symptom burden. These findings suggest general and lymphedema-specific barriers challenge exercise confidence in those with cancer-related lymphedema, and strategies tailored to improve confidence in overcoming exercise barriers are warranted. Supporting individuals to be sufficiently active during and following cancer treatment should consider behavior change strategies tailored to the unique needs faced by individuals with lymphedema.

Keywords: cancer, exercise, lymphedema, physical activity, self-efficacy

Cancer-related lymphedema is a potentially chronic condition whereby lymph fluid drainage from the interstitial space is impaired (1,2). In developed countries, lymphedema is most commonly associated with cancer and its treatment, with incidence estimated at 20-50%, depending on cancer site, for those treated for breast, gynecological, prostate, head and neck cancer and melanoma (3,4). As lymphedema is a lymphostatic disease, it can impair immune function and increase the risk of infection in the affected body areas (5,6). It may also be accompanied by a range of associated symptoms and consequences, including pain, heaviness, and skin tightness of the affected area (7), increased risk of psychosocial distress (8), depression and anxiety (9) and reductions in physical

function and QoL (10,11).

In the oncology setting, exercise has become a well-supported and recommended component of cancer treatment. The evidence in support of exercise for improving physical and mental well-being, and potentially overall survival is compelling (12,13). There is also a growing evidence base that suggests physical and psychosocial benefits can also be achieved via exercise for those with cancer-related lymphedema, and regular exercise has been associated with reductions in the severity of lymphedema-associated symptoms (14). Despite growing evidence on the importance of engaging in exercise post-cancer, including for those with or at risk of lymphedema, a recent meta-analysis examining health behavior adherence in cancer survivors found less than half (43%; 95% CI: 39,46) met physical activity recommendations (15). Further, the National Cancer Institute reported one-third are considered sedentary and do not engage in any leisure-time physical activity (16).

Even when individuals possess knowledge and know-how to be sufficiently active, this does not always translate to engaging in regular exercise. Factors such as time, accessibility and confidence may impact uptake and adherence to exercise (17). Self-efficacy, defined by Albert Bandura as 'the conviction that one can successfully execute the behavior required to produce the outcome' (18), is commonly assessed to help predict behavior change. Self-efficacy in relation to exercise barriers represents an individual's confidence and ability to overcome barriers and engage in exercise (19). Though individuals with cancer may be interested in adopting healthy behaviors such as physical activity (20), the physical and psychosocial sequelae of cancer may present barriers to exercise, in conjunction with, and magnifying, general barriers like time and motivation. Those with lymphedema can face additional barriers to being physically active. An observational study surveying 81 breast cancer survivors found higher lymphedema rates in those who reported higher kinesiophobia (fear of physical movement or activity) (21), while another cross-sectional study of 62 women with breast cancer-related lymphedema reported strong correlation between more severe lymphedema and higher kinesiophobia (22). Additionally, in a case-control study, Johansson et al (23) reported individuals with breast cancer-related lymphedema undertook fewer exercise sessions per week than individuals without lymphedema. Lymphedema and its associated complications may also present barriers to activity, limiting an individual's ability or confidence to exercise, or even perform common daily activities and maintain household and/or occupational roles (24). Additionally, uncertainty about how to care for lymphedema and avoid exacerbating the condition may lead to further activity declines, independent of actual physical limitations (24-26). However, research exploring lymphedema-related barriers to activity, including exercise, is limited. Therefore, the aim of this research was to assess exercise barriers and related self-efficacy in individuals with cancer-related lymphedema. It was also an objective to examine relationships between self-efficacy to overcome general and lymphedema-specific exercise barriers and participant characteristics, including demographic, medical, and lymphedema factors.

MATERIALS AND METHODS

A cross-sectional survey was conducted in individuals with cancer-related lymphedema. Ethical approval for this study was obtained from the Queensland University of Technology Research Ethics Unit, Brisbane, Australia (approval number 1100001471), with all research performed in accordance with the Declaration of Helsinki. Potential participants were recruited through local hospitals, physiotherapy practices, cancer support groups, and a pre-existing database of individuals with cancer-related lymphedema. Eligibility criteria included those aged 18 years and over; and diagnosed with secondary lymphedema associated with cancer treatment. There were no specific exclusion criteria. Individuals were sent a paper format survey collecting information on self-efficacy to overcome general and lymphedema-specific exercise barriers and a range of demographic, medical, and

lymphedema-specific variables, with only a single mail-out completed. Written informed consent was collected from all participants, and no incentives or costs were incurred for participation.

Outcome Variables

Self-efficacy to overcome exercise barriers was assessed using the Lymphedema Exercise Barriers Self-efficacy Scale, which is composed of a validated General Exercise Barriers Self-efficacy Scale (GEBS) and a lymphedema-specific barriers subscale (27). The GEBS scale contains nine items (28) around common barriers to exercise for cancer patients and survivors. The scale asks respondents to rate their confidence to exercise when faced with situations such as "when I'm tired" and "when I don't enjoy exercise." The scale has strong internal consistency (Cronbach's alpha=0.96), test-retest reliability ($r=0.89$, $p<0.001$) and significant associations with physical activity levels of individuals with breast cancer (28). Responses within the scale range from 0% (not at all confident) to 100% (extremely confident), with 10% intervals. On the scale, item responses are also categorized as 0-20%=not at all confident; 20-40%=slightly confident; 40-60%=moderately confident; 60-80%=very confident; 80-100% =extremely confident. The lymphedema-specific subscale is a five-item addition to the GEBS scale, using the same response scale and categories. Items include barriers such as "when I fear making my lymphedema worse" and "when I am unsure what exercise advice to follow." Previous research has demonstrated this subscale has demonstrated good construct and criterion validity, high internal consistency (Cronbach's alpha = 0.93) and test-retest reliability (ICC = 0.67, $p < 0.01$) (27).

Explanatory Variables

Demographic, medical, and lymphedema-related variables were also collected to explore potential associations with self-efficacy levels. Demographic variables included age, sex, marital and employment status, information on children, and physical activity levels [as assessed by the Active Australia Survey (29)]. Medical variables related to cancer history, including type of cancer, date of diagnosis, and type of treatment. Lymphedema-related variables included lymphedema location, diagnosis date, who diagnosed the condition, and number and severity of associated symptoms (e.g., pain, numbness, swelling). Participants were asked to self-report on symptoms experienced (i.e., number) and perceived severity (i.e., mild, moderate or severe).

Statistical Methods

Continuous variables were described using mean and 95% confidence intervals, while proportions were used to describe categorical variables. To examine barriers to exercise, mean total scores (percentages) were calculated for the general and lymphedema-specific exercise barriers self-efficacy items. Top barriers to exercise were reported based on lowest mean scores. In addition, score ranges for total scale and for each item on the scale were also determined to assess the spread of responses, as well as grouped into the categories identified on the scale (e.g., not at all-slightly confident). Results of bivariate and multivariate analyses were assessed for both clinical relevance and statistical significance. For statistical significance, analyses tested whether the null hypothesis should be accepted or rejected. To support rejecting the null hypothesis, the traditional $p < 0.05$ (two-tailed) level was used. A priori clinical relevance was defined as a change/difference of seven percentage points on the nine-item GEBS scale, as suggested by Rogers and colleagues (30). This value was the observed self-efficacy score difference between a usual care and an intervention group following three months of a physical activity behavior change intervention, which corresponded with a significant difference between groups in physical activity participation (30). As no previous research has determined a clinically significant difference for the lymphedema-specific scale, a pro-rata technique was used. That is, as a seven-point clinical difference was used

for the nine-item scale, our five-item lymphedema-specific scale was calculated as a difference of four points.

Bivariate analyses (Pearson correlation) were performed to determine whether continuous independent variables were crudely associated with either general or lymphedema-specific exercise barriers self-efficacy levels. The Student's t-test (dichotomous variables) or one-way ANOVA were used to evaluate crude associations between general and lymphedema-specific self-efficacy scores and categorical independent variables (data not presented). General linear modelling was then used to quantify the adjusted relationship between self-efficacy and several explanatory characteristics, with any potential for collinearity between variables assessed. Age was included in all models. Separate models were run for general and lymphedema-specific self-efficacy scores, and variables retained in the final models were those with theoretical importance (identified in previous research), and those with associations identified as being statistically significant or clinically relevant ($p < 0.05$). All analyses were completed using SPSS version 19.0.

RESULTS

Response rate was 52%, with 109 of 210 individuals providing data. *Table 1* presents demographic and medical characteristics of participants. In brief, respondents were on average 58 years old (95% CI: 56, 60), with 95% female. Lymphedema symptoms most frequently reported were swelling (100%), heaviness (84%), and tightness (88%).

Self-Efficacy to Overcome General and Lymphedema-Specific Exercise Barriers

Between 26% to 39% reported being "not at all confident" or only "slightly confident" to exercise when faced with seven of the nine general exercise barriers, particularly "when I am nauseated" (39%), "when exercise is not a priority" (33%), and "when I lack time" (31%) (*Table 2*). Approximately one-third of participants (32 to 39%) expressed low confidence

TABLE 1
Demographic and Medical Characteristics of Respondents

Demographic variables	**n (%)**
Age (years), mean (95% confidence intervals)	58.1 (56.1, 60.1)
Sex	
Male	5 (4.6)
Female	104 (95.4)
Marital Status	
Married/de facto	80 (73.4)
Single/widowed/divorced	29 (26.6)
Employment status	
Paid employment	67 (61.4)
Unemployed/retired	42 (38.5)
Children in care[a]	
No children	22 (20.6)
Children living at home	38 (35.5)
Children living out of home	47 (43.9)
Physical activity level[b]	
Sedentary	11 (10.1)
Insufficiently active	37 (33.9)
Sufficiently active	61 (56.0)
Medical variables	
Cancer type	
Breast	86 (78.9)
Gynecological	14 (12.8)
Other	9 (8.3)
Surgery	108 (99.1)
Chemotherapy and Radiation Therapy	
Only chemotherapy OR radiation therapy	24 (22.0)
Both	78 (71.6)
Neither	7 (6.4)
Hormone therapy	54 (49.5)
Other treatment[c]	16 (14.7)
Lymphedema-related variables	
Lymphedema on dominant side[d]	50 (46.3)
Lymphedema location	
Upper-body	87 (79.8)
Lower-body	22 (20.2)
Time with lymphedema	
< 2 years	43 (39.4)
2-5 years	43 (39.4)
> 5 years	23 (21.1)
Number of lymphedema-related symptoms[e]	
1-2	17 (15.6)
3-4	20 (18.3)
5+	72 (66.1)
Severity of lymphedema-related symptoms[f]	
Mild	14 (12.8)
Moderate	44 (40.4)
Severe	51 (46.8)

TABLE 2
Frequencies for Confidence Categories for General Exercise Barriers Self-Efficacy

Scale Item	Not at all-slightly confident n (%)	Moderately confident n (%)	Very-extremely confident n (%)
When I lack the discipline to exercise	19 (17.4)	35 (32.1)	55 (50.5)
When I am nauseated	43 (39.4)	32 (29.4)	34 (31.2)
When exercise is not a priority	36 (33.0)	39 (35.8)	34 (31.2)
When the weather is bad	32 (29.4)	34 (31.2)	43 (39.4)
When I am tired	28 (25.7)	40 (36.7)	41 (37.6)
When I am not interested in exercising	32 (29.4)	42 (38.5)	35 (32.1)
When I lack time	34 (31.2)	32 (29.4)	43 (39.4)
When I do not enjoy exercising	30 (27.5)	36 (33.0)	43 (39.4)
When I do not have someone to encourage me to exercise	26 (23.9)	41 (37.6)	42 (38.5)

TABLE 3
Frequencies for Confidence Categories for Lymphedema-Specific Exercise Barriers Self-Efficacy

Scale Item	Not at all-slightly confident n (%)	Moderately confident n (%)	Very-extremely confident n (%)
When I am worried about my appearance (e.g. due to swelling and/or compression garment).	15 (13.8)	31 (28.4)	63 (57.8)
When I am experiencing lymphedema-related symptoms (e.g. pain, heaviness, numbness/tingling, swelling).	35 (32.1)	40 (36.7)	34 (31.2)
When I fear making my lymphedema worse.	43 (39.4)	35 (32.1)	31 (28.4)
When I am unsure what exercise advice to follow.	40 (36.7)	43 (39.4)	26 (23.9)
When I am not certain if I am doing an exercise correctly.	43 (39.4)	41 (37.6)	25 (22.9)

("not at all" to "slightly confident") to exercise when faced with four of the five lymphedema-specific exercise barriers (*Table 3*).

Top barriers to exercise were determined based on responses to the general and lymphedema-specific exercise barriers self-efficacy scales. On average, participants were moderately confident (48% [*95% CI*: 44, 52]) to exercise when encountering general exercise barriers, such as not being interesting in exercising and lacking time. Respondents reported moderate confidence levels (51% [*95% CI*: 47, 55]) to engage in exercise when faced with lymphedema-specific exercise barriers, such as exacerbated symptoms and fear of worsening lymphedema. For general exercise barriers, self-efficacy scores ranged between 0% and 90%, while for lymphedema-specific situations, scores ranged between 8% to 100%.

Associations Between Exercise Barriers Self-Efficacy and Participant Characteristics

Unadjusted analyses suggested a statistically significant association between self-efficacy scores to overcome general exercise barriers and physical activity levels, number of symptoms, and severity of symptoms ($p<0.05$). Following adjustment, with age included in all models, self-efficacy levels related to general barriers were significantly lower (or clinically relevant: 7 or more percentage points lower) in females, those who were sedentary ($p<0.05$),

TABLE 4
Variables Independently Associated with General and Lymphedema-Specific Exercise Barriers Self-Efficacy

	General					Lymphedema-Specific				
Variables	n	Crude x (95% CI)	p-value	Adjusted EMM (95% CI)	p-value	n	Crude x (95% CI)	p- value	Adjusted EMM (95% CI)	p-value
Age (year; Pearson *r*)[a]	109	0.008 (Pearson *r*)	0.394		0.823	109	0.032 (Pearson *r*)	0.740		0.556
Sex										
Male	5	65.0 (31.8, 98.2)	0.068	61.1 (42.9, 79.2)	0.190					
Female	104	47.2 (43.2, 51.3)		48.2 (42.4, 53.9)						
Physical activity levels[b]										
Sedentary	11	31.4 (17.1, 45.7)	0.022*	42.0 (26.4, 57.5)	0.011*	11	36.0 (20.9, 51.1)	0.072	34.4 (20.0, 48.8)	0.075
Insufficient	37	49.8 (42.9, 56.8)		62.0 (51.2, 72.9)		37	51.4 (44.5, 58.3)		50.6 (41.4, 59.9)	
Sufficient	61	50.0 (44.0, 52.1)		59.7 (49.5, 69.9)		61	53.1 (47.1, 59.2)		51.4 (43.5, 59.3)	
Time with lymphedema										
<2 years	43	51.0 (44.9, 57.1)	0.246	58.8 (47.7, 69.8)	0.066					
>2 years	66	46.1 (40.7, 51.6)		51.3 (41.0, 61.6)						
Type of cancer										
Breast						86	52.7 (47.9, 57.5)	0.157	51.3 (44.8, 57.9)	0.179
Gynecological						14	40.0 (27.6, 52.4)		39.6 (27.0, 52.3)	
Other						9	49.7 (27.8, 71.6)		45.5 (30.3, 60.8)	
Severity of symptoms[c]										
Mild	14	60.4 (48.2, 72.6)	0.020*	62.2 (49.1, 75.3)	0.010*	14	60.4 (47.6, 73.1)	0.249	54.4 (40.5, 66.3)	0.192
Moderate	51	49.3 (44.1, 54.5)		48.4 (37.1, 59.7)		51	49.7 (43.4, 56.0)		40.9 (31.8, 50.0)	
Severe	44	42.7 (35.8, 49.7)		45.0 (33.6, 56.5)		44	49.1 (41.9, 56.3)		42.2 (33.3, 51.0)	
Number of symptoms[c]										
1-2	17	61.6 (52.1, 71.1)	0.002*	65.0 (52.3, 77.6)	0.001*	17	58.6 (46.6, 70.7)	0.074	52.1 (40.2, 64.0)	0.107
3-4	20	53.7 (45.3, 62.0)		54.7 (42.1, 67.3)		20	57.0 (44.2, 69.8)		47.9 (35.7, 60.0)	
5+	72	43.3 (38.3, 48.3)		45.3 (35.2, 55.5)		72	47.2 (42.3, 52.2)		40.3 (32.3, 48.2)	

*p< 0.05; CI: confidence intervals; EMM: estimated marginal means; [a]Age included in all models; [b]sedentary (no physical activity), insufficiently physically active (< 150 min OR ≥ 150 min and < 5 sessions), sufficiently active (≥ 150 min and ≥ 5 sessions) [29], statistically significant when comparing sedentary to insufficient and sufficient activity levels; [c]lymphedema-related symptoms, models run separately for number and severity of symptoms variables. Statistically significant when comparing mild to moderate or severe symptoms, and 5+ symptoms to 1-2 or 3-4 symptoms; data presented used model from variable with greatest clinically relevant differences, final data for general self-efficacy from number of symptoms model and final data for lymphedema self- efficacy from severity of symptoms model

had lymphedema for 2 or more years, and reported a higher number ($p<0.05$) and severity of symptoms ($p<0.05$). This was in comparison to men, those who were insufficiently or sufficiently active, had lymphedema less than two years, and reported a lower number or severity of symptoms, respectively. Multivariate analyses did not show any statistically significant or clinically relevant associations between general exercise barriers self-efficacy scores and remaining variables (i.e., marital status, employment status, children, cancer treatment, lymphedema location, type of cancer).

In relation to self-efficacy to overcome lymphedema-specific exercise barriers, clinically relevant score differences (4 or more percentage points difference) were observed in relation to physical activity levels, sex, type of cancer, number of lymphedema-related symptoms, and severity of symptoms. Following adjustment, clinically relevant associations remained for physical activity levels, cancer type, number of symptoms, and severity of symptoms (*Table 4*). Specifically, lower self-efficacy to overcome lymphedema-specific barriers was reported by individuals who were sedentary, had gynecological or other cancers, reported five or more symptoms, and had moderate or severe symptoms. This was in comparison to individuals who were insufficiently or sufficiently active, had breast cancer, and had lower number or severity of symptoms, respectively. Multivariate analyses did not show any statistically significant or clinically relevant associations between lymphedema-specific exercise barriers self-efficacy scores and remaining variables (i.e., sex, marital status, employment status, children, cancer treatment, time with lymphedema, lymphedema location).

DISCUSSION

Average self-efficacy to overcome exercise barriers was 51% (out of 100%) for lymphedema-specific exercise barriers and 48% for general exercise barriers, reflecting that on average participants had moderate confidence to engage in exercise when faced with potential barriers. Additionally, when facing the majority of these barriers, only one in three cancer survivors with lymphedema reported they were very to extremely confident to engage in exercise. Those who were sedentary, female, had gynecological or other cancers, had lymphedema for two years or longer, and those with a higher number and severity of lymphedema-related symptoms reported lower exercise barriers self-efficacy compared with other participants.

Findings highlight that individuals with cancer-related lymphedema experience both general and lymphedema-specific exercise barriers. Previous research has found general exercise barriers self-efficacy levels similar to those observed in our study in women undergoing adjuvant treatment for breast cancer (28,31), as well as post-treatment breast (31-33) and endometrial cancer survivors (34). The inclusion of lymphedema-specific barriers in this study aligns with a recent systematic review of 19 multi-cancer studies by Clifford et al (17), which highlighted key barriers to initiating and maintaining exercise were both general and cancer-related, in particular persisting treatment-related side effects, fatigue, and time. For 11 of the 14 potential exercise barriers assessed in this study, the majority of participants reported they felt at best moderately confident to overcome them, with 24-39% reporting they were not at all or only slightly confident for overcoming these exercise barriers. This highlights that overcoming barriers and engaging in exercise is viewed as challenging, even when the evidence clearly shows safety, feasibility, and benefit of exercise for individuals with and post-cancer (13,20). To increase engagement, integrating behavior change strategies among any cancer rehabilitation program or individually prescribed exercise is clearly warranted and needed. Key behavior change education should address topics such as time management, identification of motivators, identifying preferences related to exercise mode and/or location, enjoyed exercise modalities and clarity around most recent exercise advice, and finding an allied health professional if desired. Further, these findings suggest that in the absence of education and support around iden-

tifying and overcoming barriers, the long-term benefits of exercise prescription will likely be limited.

Based on mean self-efficacy scores and the minority of participants expressing high levels of confidence to overcome most exercise barriers, education and support is likely even more important for individuals with cancer-related lymphedema. Additionally, as suggested in this study, those with a greater number or severity of lymphedema-related symptoms, sedentary individuals, those with cancer other than breast and those with lymphedema for greater than two years may need increased support. Multiple studies on individuals with cancer-related lymphedema have reported the undesirable effects of symptoms on everyday life and ability and confidence to perform daily physical activity (24, 35,36). Previous research has also found higher self-efficacy is associated with higher physical activity levels (31,32) and daily energy expenditure (33), potentially whereby confidence to exercise translates to higher physical activity and conversely higher physical activity participation results in greater ability and knowledge to overcome barriers (32).

A novel finding from this study and area for further research is a lower self-efficacy level observed in gynecological and other cancer survivors, compared to breast. More than 70% of trial evidence that supports exercise benefits health, quality of life, and survival comes from studies involving women with breast cancer, and more than 90% of studies evaluating the role of exercise in the prevention and treatment of lymphedema comes from studies evaluating breast cancer-related lymphedema (37). In addition, commonly used aerobic exercise modalities involved lower-body weight bearing activity (e.g., walking), which may present an additional challenge for individuals with lower-body lymphedema from cancers such as gynecological. However, with updated guidelines promoting exercise for all cancer survivors (13), these findings suggest that an opportunity exists to enhance survivor education, particularly beyond breast cancer, to promote greater exercise awareness and confidence.

Finally, an association between lower self-efficacy and longer time with lymphedema was observed. Traditionally, lymphedema management guidelines discouraged load-bearing and repetitive use of the affected limb. While recommendations now endorse rather than discourage graded exercise and full use of the affected limb (38), it seems plausible that more recent diagnoses of lymphedema may be more likely to hear updated guidelines, whereas those with lymphedema diagnosed more than two years prior may be more likely to have been cautioned against use of the affected area. Importantly, these findings indicate that in addition to promoting more recent management guidelines and furthering the translation of research to practice, discussing exercise barriers and confidence in overcoming barriers remains relevant even for those who have managed their lymphedema for more than two years.

Limitations must be considered when interpreting findings of this research. This was a cross-sectional study involving a convenience sample of people with cancer-related lymphedema, with exploration of a specific and limited list of characteristics potentially associated with exercise self-efficacy. Of note, no information was collected (either via self-report or objectively-assessed) on functional capacity or quality of life; factors which may also influence exercise self-efficacy and are worthy of future research attention. Further, there is risk of participant bias. Respondents were primarily drawn from physiotherapy practices and hospital departments, which specialize in lymphedema treatment, which includes the provision of exercise recommendations to patients with lymphedema. This is likely reflected in over half (56%) of participants meeting national physical activity guidelines; higher than that typically reported by cancer survivors (15-17,39). It seems plausible that the potential response bias from a convenience sample such as this would lead to an overestimation of exercise barriers self-efficacy. That is, it is plausible these results reflect 'best-case' scenario and may not fully reflect the barriers or degree of confidence to overcome these barriers that the majority of those with cancer-related

lymphedema face. Further adding to the potential for an overestimation of barrier self-efficacy was that most respondents in this study either had, or were receiving, physiotherapy or other care for their lymphedema, which may have decreased the number and severity of lymphedema and potentially other cancer-related symptoms they experienced. Also, while information was collected around cancer treatment undertaken, information about current treatment status (i.e., receiving or previously received) was not. This may have impacted physical activity engagement and perceived barriers (40). Another potential limitation was that the majority (79%) reported lymphedema following breast cancer, influencing the generalizability of the average self-efficacy for all participants to other cancer-related lymphedema groups. Given the associations between self-efficacy and cancer type, further research focused on individuals with cancer types other than breast is needed. While findings suggested an association between sex and general self-efficacy, sensitivity analyses showed no significant change to results when excluding sex from the model. With a low number of male participants (n=5), this result warrants further investigation as previous research in breast and prostate cancer survivors has reported similar self-efficacy levels between males and females (41,42). Finally, it should be acknowledged that recruitment processes allowed for a one-off only single mail out (which led to our 52% response rate), with no ability to improve response rate through a second mail out or other follow-up mechanism.

CONCLUSION

The results clearly highlight the importance of recognizing and understanding exercise barriers faced by those with cancer-related lymphedema. Even in an active, educated population, barriers to exercise were prevalent. Without sufficient support and justifiable advice to help this cohort to become and stay active, it will be difficult for clinical recommendations from research trials to be translated into practice. Medical and allied health professionals working with cancer clients, particularly those impacted by cancer-related lymphedema, should consider inclusion of strategies to overcome common exercise barriers when encouraging clients to be active. Education on recommended activity guidelines may not be sufficient to ensure regular, lasting exercise participation in this population. Given the known physical and psychosocial benefits of remaining active during and following cancer treatment, there is significant scope to deliver exercise prescription alongside engagement strategies.

CONFLICT OF INTEREST AND DISCLOSURE

The authors declare no competing financial interests exist.

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